

REMARKS/ARGUMENTS

Claims 1-4 and 7-16 are active.

The claimed invention provides a method for removing sulfur compounds contained in a hydrocarbon-containing gas comprising feeding a hydrocarbon-containing gas to a desulfurizing bed to remove sulfur compounds contained in the hydrocarbon-containing gas, wherein the desulfurizing bed comprises:

a desulfurizing agent A comprising at least one metal component selected from the group consisting of Ag, Cu, Ni, Zn, Mn, Fe, Co, an alkali metal, an alkaline earth metal and a rare earth metal carried on a zeolite; and

a desulfurizing agent B comprising at least one selected from the group consisting of cerium oxide and a metal component-carried on a porous inorganic oxide, wherein

the metal component-carried on a porous inorganic oxide is one selected from the group consisting of Ag, Cu, Ni, Zn, Mn, Fe, Co, Al, Si, an alkali metal, an alkaline earth metal and a rare earth metal, and

the porous inorganic oxide is at least one selected from the group consisting of alumina, silica, silica-alumina and cerium oxide.

The rejection of Claims 1-4 and 7-16 under 35 U.S.C. 103(a) over Takashi et al. (JP 2001-278602) in view of Satokawa et al. (U.S. 2001/0014304) is respectfully traversed.

Takashi is directed to a method for removing sulfur contaminants from petroleum hydrocarbons, by contacting the petroleum hydrocarbon with a first desulphurization agent which is a halide compound supported on a porous substrate [0005] and [0007] (17<sup>th</sup> group element, preferably Bromine) and a second desulphurization agent such as Co-Mo/alumina or Ni-Mo/alumina [0010].

Takashi describes the function of the halogen (Bromine) is to form a sulfur bromide which is more easily adsorbed than benzothiophenes and dibenzothiophenes and therefore removed by a porous adsorbent [0007].

Satokawa describes a zeolite ion-exchanged with one or more transition metals as an adsorbent for removing sulfur compounds such as sulfides, thiophenes or mercaptans, from fuel gas (Abstract).

The Office alleges (Official Action dated February 25, 2010, page 4, paragraph 4) that the first desulphurization agent of Takashi and the zeolite ion-exchanged with a transition metal of Satokawa are “functionally similar in the desulfurization process” because both references indicate that the two different agents are able to perform in the presence of moisture.

Applicants submit that the Office continues to fail to recognize the mode of operation of the Takashi agent which is described in [0007] as follows (machine translation):

This bromine reacts with sulfur and changes to a sulfur bromide with the adsorption capacity force higher than benzothiophene and dibenzothiophene.

In contrast, the agent described by Satokawa is a simple adsorbent which does not provide for formation of a sulfur bromide and therefore, replacement of the Takashi Group 17 carrying zeolite with the agent of Satokawa would change the principle of operation of the primary reference.

The MPEP § 2143.01 VI. states:

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.

Takashi requires a halogenation of the sulfur in the organic structure to render the compound more efficiently adsorbed. Applicants submit that one of ordinary skill in the art

would recognize the significant differences of the two agents and not make the combination the Office has alleged.

Applicants further note that Satokawa corresponds to JP 2001-286753 which is described in the specification on page 4, lines 1-8, as not effective for the absorption of carbonyl sulfide.

Moreover, Applicants submit that the data shown in Table demonstrates a synergistic improvement in desulfurization is obtained by the combination of agents A and B according to the invention. The data for Example 1 and Comparative Examples 1 and 2 are shown below.

Example	COS	DMS	TBM	DMDS
1	6	11	>15	15
Comp. 1	0	11	>15	9
Comp. 2	1	0	>15	3

In the table, COS is carbonyl sulfide, DMS is dimethyl sulfide, TBM is t-butylmercaptan and DMDS is dimethyl disulfide. The numbers in the table show the hours of catalyst effectiveness in removing the listed contaminant from a feed stream containing the contaminants. Applicants note that Comp. 1 corresponds to the desulfurizing agent described by Satokawa and Example 1 is a catalyst according to the invention which is a combination of the two comparative example agents.


As indicated in the table, the desulfurizing agent according to the invention is effective for removal of COS and DMDS for significantly longer time than would be expected based on the individual components and shows a synergistic improvement. Applicants submit that such a showing of greater than expected results is evidence of nonobviousness which supports the patentability of the present invention.

Accordingly, and in view of all the above, applicants submit that the cited combination of references cannot render the claimed invention obvious and respectfully request that the rejection of Claims 1-4 and 7-16 under 35 U.S.C. 103(a) over Takashi in view of Satokawa be withdrawn.

Applicants respectfully submit that the above-identified application is now in condition for allowance and early notice of such action is earnestly solicited.

Respectfully submitted,

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